TOP SECRET

PIR

PHOTOGRAPHIC INTELLIGENCE REPORT

I M
A N
D I

[redacted]

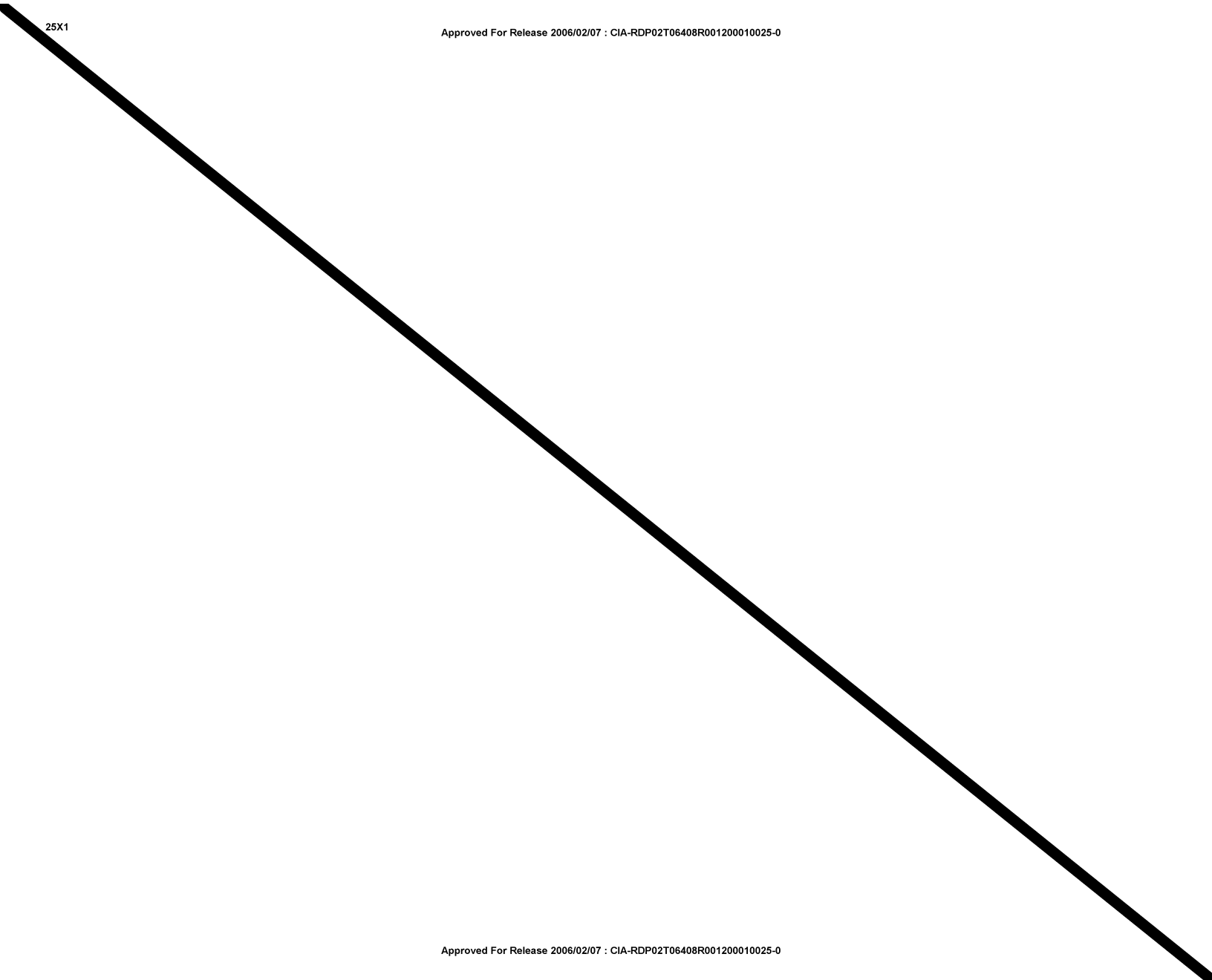
STUDY OF SELECTED NITROGEN FERTILIZER PLANTS IN CHINA AND NORTH KOREA FOR HEAVY WATER PRODUCTION FACILITIES

25X1

25X1

CIA/PIR 73015
DATE OCTOBER 1966
COPY 1
PAGES 15

TOP SECRET



RECORD COPY	COPY NO.	PUB. DATE	LOCATION	MASTER	DATE RECEIVED	LOCATION
				STOCK	MINIMUM 1	MAXIMUM 10

DISPOSITION DATE(S)

CUT TO COPIES	DATE	CUT TO COPIES	DATE	COPIES DESTROYED
CUT TO COPIES 0	DATE 1-73	CUT TO COPIES	DATE	103
CUT TO COPIES	DATE	CUT TO COPIES	DATE	
CUT TO COPIES	DATE	MASTER	DATE	

DATE MO.	DAY	YR.	RECEIVED OR ISSUED	NUMBER OF COPIES REC'D	ISS'D	BAL
11	9	66	Dist. Unit #39-48	10		10
11	12	68	NPIC #39		1	9
8	3	72	Dest # 40-48			0 W K fo
8	3	72	Copy # 10 also found and Dest. W.K.G			
			PIR 73015			

DATE MO.	DAY	YR.	RECEIVED OR ISSUED	NUMBER OF COPIES REC'D	ISS'D	BAL

25X1

TITLE NPIC

SEC. CLASS. TS LOCATION 21967 34761

Oct. 1966

25X1

STUDY OF SELECTED NITROGEN FERTILIZER PLANTS IN CHINA AND NORTH KOREA FOR HEAVY WATER PRODUCTION FACILITIES

SUMMARY

A study of eight nitrogen fertilizer plants in Communist China and one in North Korea has revealed only one plant with photographic characteristics of a heavy water (deuterium oxide, D_2O) production facility. A new facility at the Chi-lin (Kirin) Chemical Fertilizer Plant is considered to be a possible heavy water production plant. Construction of this facility began in late 1963, and is still in progress.

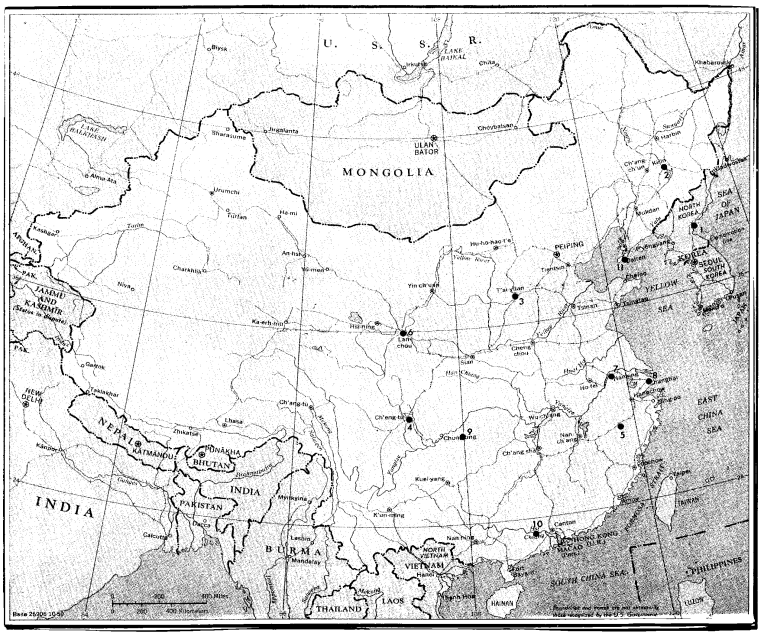


FIGURE 1. LOCATION MAP

1.	Hungnam, North Korea	39-50N 127-38E
2.	Chi-lin (Kirin), China	43-55N 126-33E
3.	Tai-yuan, China	37-46N 112-28E
4.	Cheng-tu, China	30-53N 104-20E
5.	Chu-hsien, China	28-54N 118-53E
6.	Lan-chou, China	36-07N 103-34E
7.	Nan-ching, China	32-12N 118-45E
8.	Tein-li Institute for Industrial and Chemical Research, Shang-hai, China	31-13N 121-23E
9.	Tzu-liu-ching, China	29-21N 104-45E*
10.	Kao-yao, China	23-03N 112-27E*
11.	Ta-lien (Dairen), China	38-58N 112-37E

* Available photography does not reveal a nitrogen fertilizer plant at this location.

INTRODUCTION

25X1 [redacted] photography was used for this study in an attempt to locate facilities currently producing heavy water, and to locate any such facilities that might be under construction. Such information may then help determine the capability of Communist China to produce heavy water or to obtain it from North Korea.

The methods of producing heavy **water which appear** to be best suited for large scale, economical operations are: (1) distillation, (2) electrolysis of water, and (3) chemical exchange. Of these methods, the distillation of hydrogen gives evidence of being the most economical and practical. For this reason, and the easy adaptability of the process to existing Nitrogen Fertilizer Plants, only installations of this type are included in this report.

In all plants studied there are some buildings and equipment which could not be identified as to process or function. Although these items have not been identified, the probability that they are producing heavy water has been negated for one or more of the following reasons: (1) There is no evidence of the typical security employed by the Chinese and North Koreans at their nuclear associated projects; (2) The facility is located in such a position within the plant, that it is not an integral part of the hydrogen or ammonia production area; (3) The identical building or buildings appear in more than one plant, and it is improbable that more then one heavy water production facility would be built at this stage of the Chinese Atomic Energy Program; and (4) The equipment or building was present within the plant before an active atomic energy program was initiated in Communist China.

No attempt has been made to incorporate all of the identified items of each plant into the text of this report, although, these items had to be identified in order to study the plants. It was felt that a detailed description would be beyond the objectives of this report.

HUNGNAM NITROGEN FERTILIZER PLANT
HUNGNAM, NORTH KOREA

The Hungnam Nitrogen Fertilizer Plant (39-50N 127-38E), is the largest of its kind in North Korea, and is located 5.8 nautical miles south-southeast of Hamhung. Situated adjacent to the Wosan to Ch'ongjin Railroad on the east coast of North Korea, the plant is also afforded the facilities of the Port of Hungnam. The Hungnam plant produces a variety of chemical fertilizers, including ammonium nitrate, ammonium sulfate and superphosphate, and many chemical intermidiaries.

A detailed analysis of the buildings and equipment used in the production, purification, and utilization of hydrogen in this plant has failed to reveal any photographic evidence of heavy water production.

As previously mentioned, distillation of hydrogen and electrolysis of water are both considered to be economical for heavy water production. For this reason a detailed analysis of the electrolytic process and subsequent hydrogen production was made as follows:

Receiving electrical power from the Changjin and Pujon power systems 1/. The rectifier section (Item 3, Figure 2) converts the incoming A. C. power to D. C. power for use in the electrolysis section (Item 4, Figure 2). The electrolysis section produces hydrogen from electrolyzed water. There is no photographic evidence to indicate that the electrolysis process is taken beyond this point as it must be to produce heavy water. The absence of Barr towers (scrubbers of the partially enriched water) is evidence that re-enrichment of the water does not occur.

An additional source of hydrogen in the plant is a new Anthracite Gasification Pilot Plant (Item 31, Figure 2). The gasification or partial oxidation of anthracite coal is accomplished by burning the coal in the absence of air. By introducing air and (or) steam several gases can be produced, notably water gas (blue gas - $CO+H_2$) and producer gas ($N_2+H_2+CO_2$). The presence of a small steam plant is suggestive that one or both of these gases are produced here. Purification of the gas(es) is accomplished by four possible CO_2 absorbers (Item 43, Figure 2) and the possible CO removal section (Item 44, Figure 2). There does not appear to be any equipment present for distillation of the purified hydrogen, thus negating this area as a heavy water production facility.

REFERENCES

[redacted] 25X1

MAPS

ACIC. US Air Target Chart, Series 200, Sheet 0384-4HL, Scale 1:200,00 3rd ed., August 1964. (SECRET)

DOCUMENTS

1. 1536/61, Hungnam Chemical Fertilizer Plant, 24 November 1961, Headquarters, 500th Intelligence Corps Group, APO 67. (FOR OFFICIAL USE ONLY)

*2. Shreve, R. Norris, The Chemical Process Industries, 2nd ed., McGraw Hill Book Co. Inc., N. Y., N. Y. (UNCLASSIFIED)

*3. Mack, E.; Garrett, A.; Haskins, J.; and Verhoek, F.; Textbook of Chemistry, 2nd ed., Ginn and Co., N. Y., N. Y. (UNCLASSIFIED)

* Note: Items used throughout report.

HUNGNAN NITROGEN FERTILIZER PLANT

Ammonia Production
1. Electrical substation
2. Transformer maintenance building
3. Rectifier section
4. Electrolysis section
5. Possible experimental and business office
6. Gasholders
7. Compressor section
8. Converter section
9. Ammonia storage tanks
10. Air liquefaction shop

Ammonium Sulfate Production
11. Ammonium Sulfate production section
12. Ammonium sulfate storage section
13. Ammonium sulfate production and storage

Sulfuric Acid Production (Chamber Process)
14. Conveyor system and possible crusher
15. Possible roasting section for second plant
16. Acid chambers
17. Roasters for first plant
18. Possible acid storage tanks
19. Possible sulfide ore storage building
20. Probable third sulfuric acid plant

Nitric Acid Production
21. U/I building
22. Possible air intake
23. Low pressure acid absorbers
24. Waste gas dispersal tower
25. Probable acid storage tanks

Ammonium Nitrate Production
26. Reactor building
27. Prilling towers
28. Conveyor system
29. Ammonium nitrate loading facility
30. Prilling tower u/c

Gas Plant
31. Retort building
32. Possible coal storage building
33. Conveyor system
34. Steam plant

U/I Processing Area
35. Production area

Possible Magnesia Production
36. Production and storage section
37. Possible rectifier section

Gas Purification Area
38. CO_2 absorbers
39. Condensing tower
40. Possible contact oven building
41. Gasholders
42. Possible reform oven building
43. CO_2 absorbers
44. Sulfur removal

U/I Processing Area
45. Production Area

Probable Urea Plant Under Construction
46. Production Area

[redacted] 7X 25X1

FIGURE 2. HUNGNAM NITROGEN FERTILIZER PLANT, NORTH KOREA [redacted] 25X1

CHI-LIN CHEMICAL FERTILIZER PLANT
CHI-LIN (KIRIN), CHINA

The Chi-lin Chemical Fertilizer Plant (43-55N 126-33E) is located approximately 4.8 nautical miles north of Chi-lin on the east bank of the Sung-hua Chiang River. The plant, which is rail-served, is similar in appearance to the Tai-yuan and Lan-chou Fertilizer Plants. A synthesis gas, containing hydrogen, is produced in the retort building (Item 4, Figure 3). The gas, produced by gasification of coal or coke, is purified through a series of absorbers and towers (Items 9, 15, 16, and 17, Figure 3) and is then compressed and synthesized into ammonia. An analysis of this process failed to reveal any unusual equipment or facilities which might produce heavy water.

A possible heavy water facility was, however, located in the northwest corner of the plant. The facility is presently undergoing a third phase of construction but was originally begun in late 1963. The first phase of construction was confined to an area within the wall surrounding the fertilizer plant. A possible pilot plant and research facility were constructed at this time. In mid 1964 the second phase of construction was observed. When finished, an electrical substation, a possible rectifier building, an electrolysis building, and a production building were completed in addition to several support buildings. A portion of the plant wall was extended to accommodate this new construction. The third phase of construction is now in progress, but it is too early to identify the facilities under construction as to specific function. A portion of the security wall was removed to accommodate the new construction, and the new wall is not yet completed.

REFERENCES

25X1 [redacted]

TAI-YUAN CHEMICAL FERTILIZER PLANT
TAI-YUAN, CHINA

The Tai-yuan Chemical Fertilizer Plant (37-46N 112-28E) is the southernmost plant of the Tai-yuan Chemical Combine. It is located on the western shore of a reservoir, 7.5 nautical miles southwest of Tai-yuan, China. The plant is rail-served and has access to a modern dual lane highway. As in many of the Chinese fertilizer plants, hydrogen gas is produced in a gas retort building (Item 4, Figure 4) in the form of producer gas (N_2+H_2+CO_2). After purification, (Items 9 & 10, Figure 4) the gas is synthesized into ammonia (Items 14 & 15, Figure 4). Throughout this production phase there are no equipment or buildings that would indicate heavy water production. There are no other sources of hydrogen within this chemical fertilizer plant.

REFERENCES

25X1 [redacted]

MAPS

U. S. Air Target Chart, Series 200, Sheet 0382-13AL, scale 1:200,000, 2nd ed., October 1960. (SECRET [redacted] 25X1

CHI-LIN (KIRIN) CHEMICAL FERTILIZER PLANT

Ammonia Production
1. Coal storage yard
2. Coal receiving and storage building
3. Conveyor system
4. Retort building
5. Waste disposal conveyor
6. Gasholders
7. Possible crushing section
8. Gasification of coal (Retort building)
9. Probable reform ovens
10. U/I building
11. Possible Methane Production
12. U/I building
13. U/I building
14. U/I building
15. Sulfur removal and possible contact
16. Scrubbers ovens
17. Probable CO_2 absorbers
18. Compressor building (purpose unknown)
19. Compressor building
20. Possible oil filters
21. Synthesis building
22. Converter towers
23. Gasholders
24. Gasholders

Suspect Explosives Production
25. U/I building
26. U/I building
27. U/I building
28. U/I building

U/I Process
29. U/I building
30. U/I building

Nitric Acid Production
31. Air intakes
32. Possible compressor and filter building
33. Oxidation building
34. Probable heat exchangers
35. Low pressure acid absorbers
36. Medium pressure acid absorbers
37. High pressure acid absorbers
38. Waste gas dispersal tower

U/I Process
39. U/I building
40. U/I building

U/I Shipping facility
41. Four semi-buried tanks
42. Rail tank car loading facility
43. Loading facility

Ammonium Nitrate Production
44. Reactor building
45. Prilling towers
46. Packing and shipping facility

Possible Ammonium Sulfate Production
47. Production section
48. Packing and shipping facility

Possible Concentrated Nitric Acid Production
49. Possible shipping facility
50. Possible shipping facility
51. U/I building
52. U/I building
53. U/I equipment
54. U/I equipment

U/I Process
55. Production building
56. Storage tanks
57. Warehouse/storage

Possible Heavy Water Production
58. U/I building
59. Possible support building
60. Possible water treatment
61. Possible water treatment
62. Gas storage
63. U/I building
64. Suspect hydrogen distillation building
65. Electrolysis building
66. Rectifier building
67. Electrical substation

FIGURE 3. CHI-LIN (KIRIN) CHEMICAL FERTILIZER PLANT, CHINA

25X1
25X1

TAI-YUAN CHEMICAL FERTILIZER PLANT

Ammonia Production
1. Coal storage yard
2. Possible crushing section
3. Conveyor system
4. Retort building
5. Possible methane production
6. Incoming steam line from the Tai-yuan Heat and Power Plant TETS
7. Gasholders
8. Reform ovens
9. Sulfur removal and contact ovens
10. Probable CO_2 absorbers
11. Compressor building
12. Gasholders
13. Possible oil filter
14. Synthesis building
15. Converter towers
16. Forced draft cooling tower

U/I Process
17. U/I building
18. U/I building

Nitric Acid Production
19. Oxidation building
20. High pressure acid absorbers
21. Waste gas dispersal tower
22. Acid storage tanks

U/I Process
23. Production building
24. Gasholders

Possible Concentrated Nitric Acid Production
25. U/I building
26. U/I equipment
27. U/I equipment
28. U/I building
29. Shipping facility

Suspect Explosives Production
30. U/I building
31. U/I building
32. U/I equipment
33. Possible gas storage
34. U/I equipment
35. U/I building

Ammonium Nitrate Production
36. Reactor building
37. Prilling towers
38. Packing and shipping facility
39. Warehouse/storage

U/I Shipping Facility
40. Four semi-buried tanks u/c
41. Control/pumphouse u/c
42. Rail tank car loading facility
43. Loading facility

Water Intake
44. Control/pumphouse

FIGURE 4. TAI-YUAN CHEMICAL FERTILIZER PLANT, CHINA

25X1
25X1

CHENG-TU CHEMICAL FERTILIZER PLANT
CHENG-TU, CHINA

The Cheng-tu Chemical Fertilizer Plant (30-53N 104-20E) is located 15.2 nautical miles northeast of the center of Cheng-tu on a rail spur of the Cheng-tu/Kuang-han railroad. Ammonium nitrate, ammonium sulfate, ammonia, nitric acid and sulfuric acid are among the chemicals and fertilizers produced at the plant.

An analysis of hydrogen/ammonia processing procedures indicates that the hydrogen distillation process, much like that devised by Hydrocarbon Research, Inc., would probably be best suited for this facility 1/. On this basis, a detailed analysis of the equipment in the plant was made. Starting with the synthesis gas production (Items 5, Figure 5), the gas moves through a series of purification steps (Items 7, 8, 10, and 11, Figure 5). Following purification the gas is compressed and synthesized into ammonia. Since no unusual equipment is present along the flow of gas, from the initial production of the synthesis gas to production of ammonia, it is felt that there are no facilities within the fertilizer plant which produce heavy water.

REFERENCES

25X1

[redacted]

DOCUMENTS

1. NYO-889 (Del.) Final Report to U. S. Atomic Energy Commission; Low Temperature Heavy Water Plant, March 15, 1951, Hydrocarbon Research, Inc., N. Y., N. Y. (UNCLASSIFIED)

CHU-HSIEN CHEMICAL FERTILIZER PLANT
CHU-HSIEN, CHINA

The Chu-hsien Chemical Fertilizer Plant (28-54N 118-53E) is located 3.5 nautical miles south-southeast of Chu-hsien, China, on a rail spur of the Chiang-shan/Chu-hsien railroad. The plant produces a variety of acids, fertilizers and chemical intermediaries.

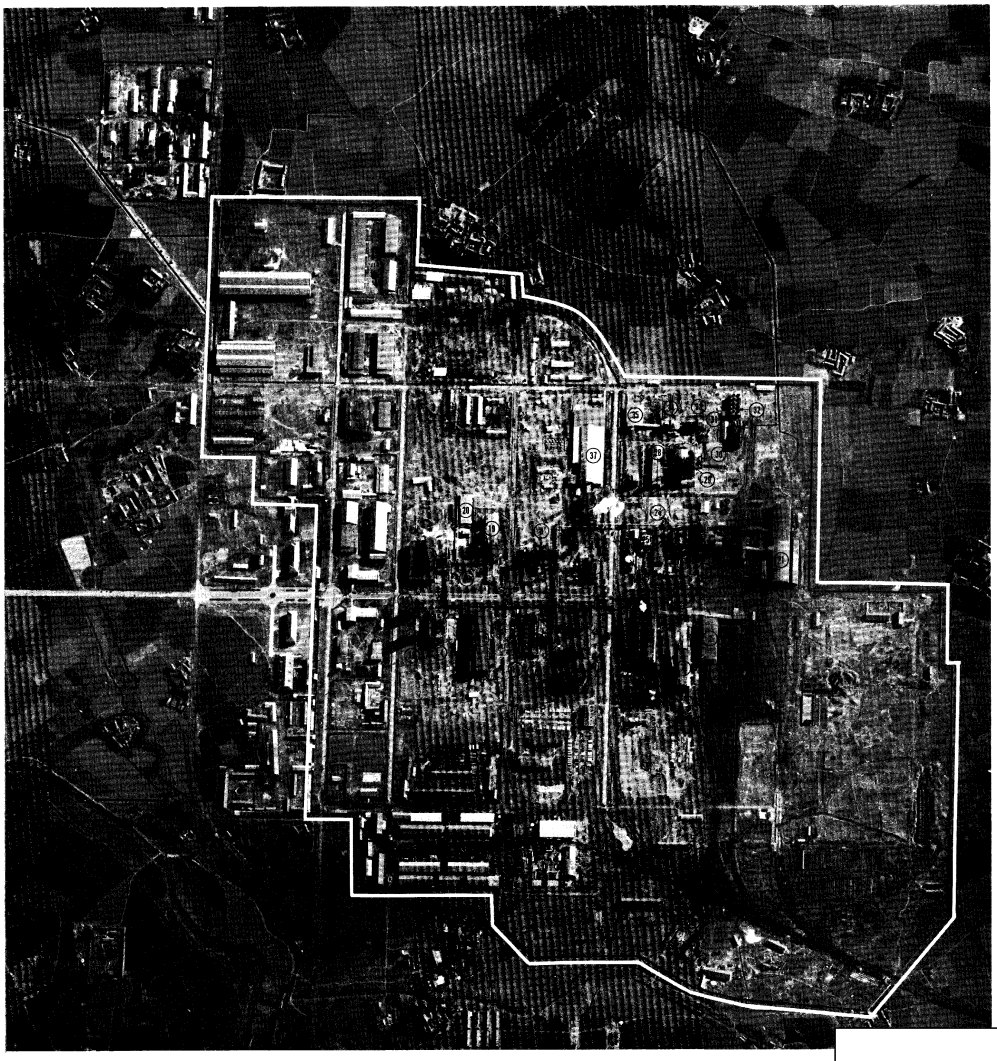
An analysis of the various components of this plant revealed no special chemical equipment or buildings which would be indicative of heavy water production. A detailed study was made on all phases dealing with the production/use of hydrogen. Item 4, Figure 6 is the gas retort building, and the presence of a small steam plant (Item 3, Figure 6) indicates that hydrogen is manufactured in the form of water gas ($CO+H_2$) or producer gas ($N_2+H_2+CO_2$). The purification steps and the synthesis of the gas into ammonia were also studied, but no unusual equipment was found. A second source of hydrogen is located in the area of the plant which makes chlorine and caustic soda. Electrolysis of brine (Item 36, Figure 6) produces chlorine, caustic soda, and hydrogen. A study of the pipelines adjacent to this building reveals that the hydrogen is used in the production of hydrochloric acid (Item 47, Figure 6).

REFERENCES

[redacted] 25X1

MAPS

ACIC. U. S. Air Target Chart, Series 200, Sheet 0493-20HL, scale 1:200,000, 2nd ed., July 1963. (SECRET)



CHENG-TU CHEMICAL FERTILIZER PLANT

Ammonia Production
1. Coke storage yard
2. Coke unloading building
3. Conveyor system
4. Steam plant
5. Retort building
6. Gasholders
7. U/I building
8. Scrubbers
9. U/I process
10. Possible CO_2 absorbers
11. Sulfur removal
12. Gasholder
13. Compressor building
14. Possible oil filters
15. Synthesis building
16. Converter towers

U/I Process
17. U/I building
18. U/I building
19. U/I building
20. U/I building

Sulfuric Acid Production (Contact Process)
21. Sulfide ore receiving building
22. Roasting section
23. U/I equipment
24. U/I equipment
25. U/I equipment
26. Acid storage tanks
27. Waste ore removal building

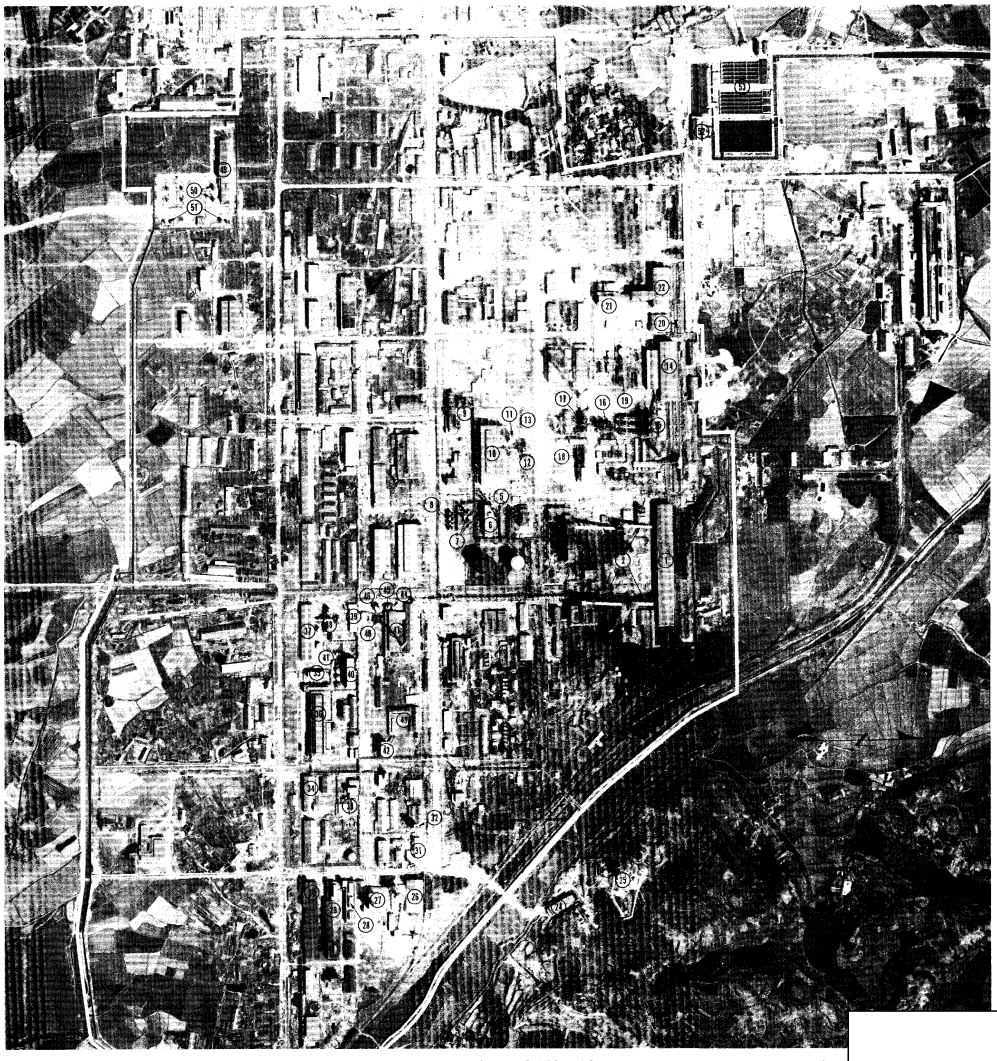
Nitric Acid Production
28. Oxidation building
29. Low pressure acid absorbers
30. Waste gas dispersal tower
31. Acid storage tanks
32. Forced air cooling towers

Ammonium Nitrate Production
33. Reactor building
34. Granulating building
35. Packing and shipping building

Possible Ammonium Sulfate Production
36. Production building
37. Storage, packing and shipping building

FIGURE 5. CHENG-TU CHEMICAL FERTILIZER PLANT, CHINA -

25X1



CHU-HSIEN CHEMICAL FERTILIZER PLANT

Ammonia Production
1. Coal receiving building
2. Conveyor system
3. Steam plant
4. Retort building
5. Gas purification
6. Gas purification
7. Gas purification
8. Gas purification
9. U/I process
10. Compressor building
11. Converter tower
12. Possible aqueous ammonia production
13. Possible aqueous ammonia storage

Sulfuric Acid Production (Contact Process)
14. Pyrite ore receiving and storage building
15. Pyrite roasting unit
16. Converters
17. Acid tower
18. Cooling tubes
19. Acid storage tanks
20. Shipping facility

Ammonium Sulfate Production
21. Reactor building
22. Storage and shipping building

Iron Production
23. Small iron furnaces

Liquid Air Production
24. Compressor building
25. Gas storage

Calcium Carbide and Cyanamide Production
26. Raw materials storage
27. Kiln section
28. Calcium carbide furnace section
29. Acetylene and cyanamide production building
30. Storage building

Polyvinylchloride Production
31. Lime production section
32. Lime silos
33. Possible polymerization kettle section
34. Possible dryer section

Hydrogen, Chlorine and Caustic Soda Production
35. Rectifier section
36. Electrolysis building
37. Raw materials storage
38. Brine preparation section
39. Chlorine drying section
40. Caustic soda evaporation building
41. Caustic soda storage tanks

Bleaching Powder Production
42. Possible production building
43. Packing and shipping building

Hydrochloric Acid Production
44. Probable chlorine storage
45. Probable hydrogen storage
46. Probable water storage
47. Acid production section
48. Acid storage tanks

Electrical Substation
49. Control/switching building
50. Transformers
51. Oil storage tanks

Water Treatment Plant
52. Control/pumphouse
53. Water basins

25X1

FIGURE 6. CHU-HSIEN CHEMICAL FERTILIZER PLANT, CHINA -

LAN-CHOU NITROGEN FERTILIZER PLANT
LAN-CHOU, CHINA

The Lan-chou Nitrogen Fertilizer Plant (36-07N 103-34E) is situated approximately 14.1 nautical miles west-northwest of the Lan-chou Airfield. The plant is on the southeastern bank of the Huang Ho (Yellow River), and is a large producer of chemical fertilizers and ammonia. The process of hydrogen/ammonia production is identical to the process used at the Chi-lin and Tai-yuan Fertilizer Plants and for this reason will not be discussed at this point. It is sufficient to say that detailed analysis reveals no heavy water facilities at this plant.

REFERENCES

25X1 [redacted]

MAPS

ACIC. U. S. Air Target Chart, Series 200, Sheet 0383-22HL, scale 1:2000, 2nd ed., May 1964. (SECRET)

NAN-CHING CHEMICAL PLANT
NAN-CHING, CHINA

The Nan-ching Chemical Plant (32-12N 118-45E) is part of the Yung-li Chemical Industry, and is located on the northwest bank of the Chang CHiang River approximately 10.2 nautical miles north of Nan-ching. The plant is served by both rail and water and produces a variety of chemicals in addition to ammonia, sulfuric and nitric acids and nitrogen fertilizers. The hydrogen/ammonia production is typical of other Chinese plants in that coal is burned in a retort building, (Item 3, Figure 8) and is then purified (Item 6, Figure 8). The gas is then combined with nitrogen obtained from the liquid air plant (Item 7, Figure 8), and synthesized to form ammonia. No facilities having the characteristics of a heavy water plant were observed within this plant.

REFERENCES

25X1 [redacted]

LAN-CHOU NITROGEN FERTILIZER PLANT

Ammonia Production
1. Coal receiving and storage building
2. Possible crushing section
3. Conveyor system
4. Retort building
5. Possible methane production
6. Incoming steam line from the Lan-chou Thermal Power Plant
7. U/I building
8. Gasholders
9. U/I process (possible gas purification)
10. Sulfur removal and contact ovens
11. Probable CO_2 absorbers
12. Compressor building
13. Gasholders
14. Possible oil filters
15. Synthesis building
16. Converter towers
17. Compressor building
18. manifold

U/I Process
19 U/I building
20. U/I building

U/I Process
21. U/I building
22. U/I towers
23. Probable shipping facility

Nitric Acid Production
24. Oxidation building
25. High or medium pressure acid absorbers
26. Waste gas dispersal tower
27. Acid storage tanks

U/I Process
28. Production building
29. Storage tanks

Possible Concentrated Nitric Acid Production
30. U/I building
31. U/I equipment
32. U/I equipment
33. U/I building
34. Shipping facility
35. Dilute nitric acid storage tank

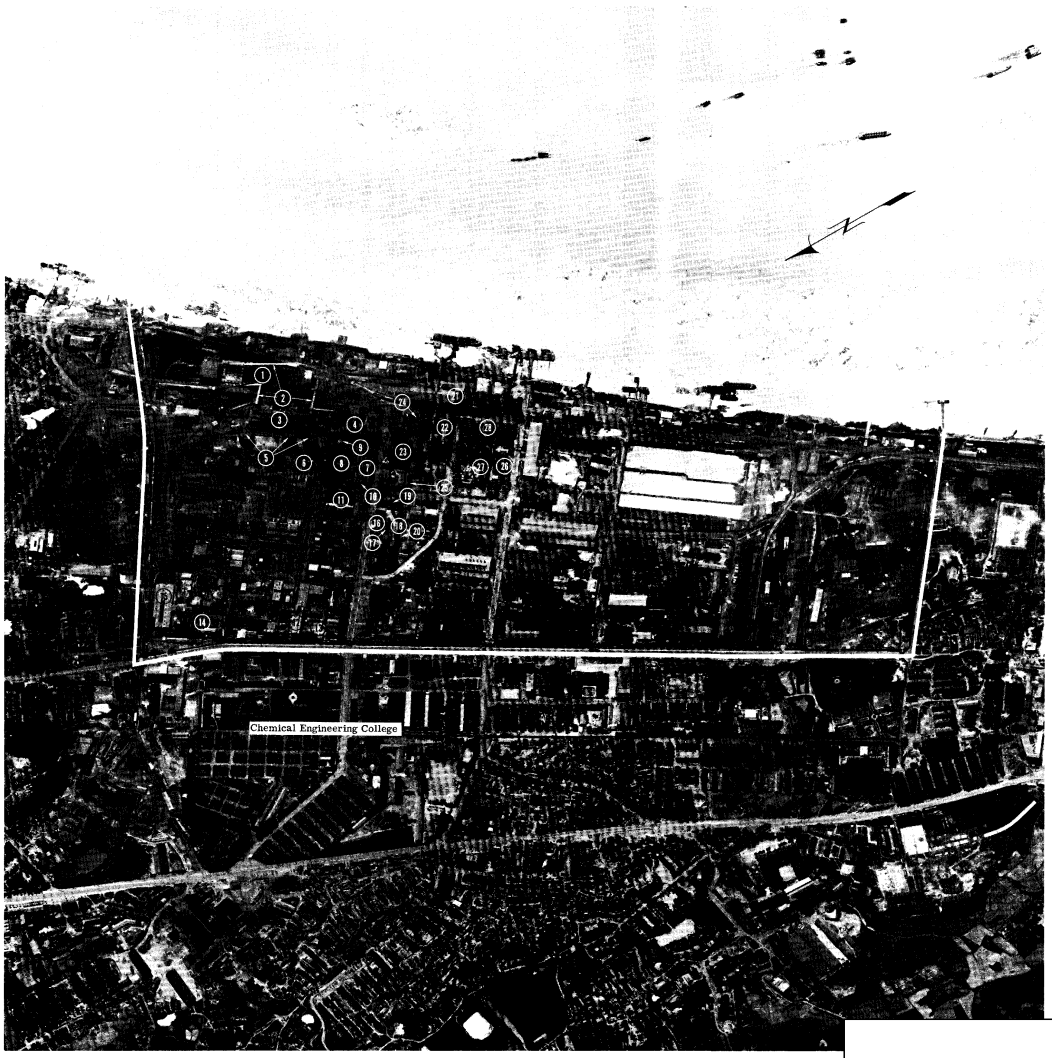
Ammonium Nitrate Production
36. U/I building
37. Reactor building
38. Prilling towers
39. Packing and shipping facility

Suspect Explosives Production
40. U/I building
41. U/I building
42. U/I building
43. U/I equipment
44. U/I equipment

U/I Shipping Facility
45. Four semi-buried tanks
46. Control/pumphouse
47. Rail tank car loading facility
48. Loading facility

U/I Process
49. Production building
50. Possible shipping facility
51. Storage tanks

FIGURE 7. LAN-CHOU NITROGEN FERTILIZER PLANT, CHINA [redacted] 25X1



NAN-CHING CHEMICAL PLANT

Ammonia Production
1. Coal receiving yard and storage area
2. Conveyor system
3. Retort building
4. Steam plant
5. Gasholders
6. Probable gas purification
7. Liquid air plant
8. Compressor section
9. Converter tower
10. Possible gas purification absorbers
11. Forced draft cooling towers

Probable Ammonium Carbamate Production
12. Autoclave section
13. Storage and shipping section

Urea Production
14. Production building
15. Packing and storage facility

Nitric Acid Production
16. Possible ammonium nitrate production
17. Possible ammonium nitrate production
18. Low pressure acid absorbers
19. Waste gas dispersal stack
20. Oxidation building

Sulfuric Acid Production (Contact Process)
21. Sulfide ore receiving buildings
22. Roasting section
23. Acid absorbers
24. Sulfur trioxide cooling tubes
25. Probable acid storage tanks

Ammonium Sulfate Production
26. Protoate saturaters
27. Production building
28. Storage and shipping facility

FIGURE 8. NAN-CHING CHEMICAL PLANT, CHINA -

25X1

TEIN-LI INSTITUTE FOR INDUSTRIAL AND CHEMICAL RESEARCH SHANG-HAI, CHINA

The Tein-li Institute for Industrial and Chemical Research (31-13N 121-23E) of the Shang-hai Chemical Plant (Figure 9) is located approximately 2.8 nautical miles northeast of the Hung-chiao Airfield on the northern bank of the Su-chou Ho.

The institute is involved in research on a variety of problems, including work on ammonia, nitric acid, and fertilizers.

Due to the fact that most of the projects at this institute are of a research nature or confined to pilot plant type facilities, identification of individual processes was almost impossible. A gas retort building, steam plant, nitric acid plant and probable ammonia plant were observed and are annotated on Figure 9.

There is no photographic evidence to support the possibility of research work or production of heavy water at this installation.

REFERENCES

25X1 [redacted]

MAPS

ACIC. U. S. Air Target Chart, Series 200, Sheet 0492-2HL, scale 1:200,000, 2nd ed., August 1964. (SECRET)

TA-LIEN (DAIREN) CHEMICAL COMBINE TA-LIEN (DAIREN), CHINA

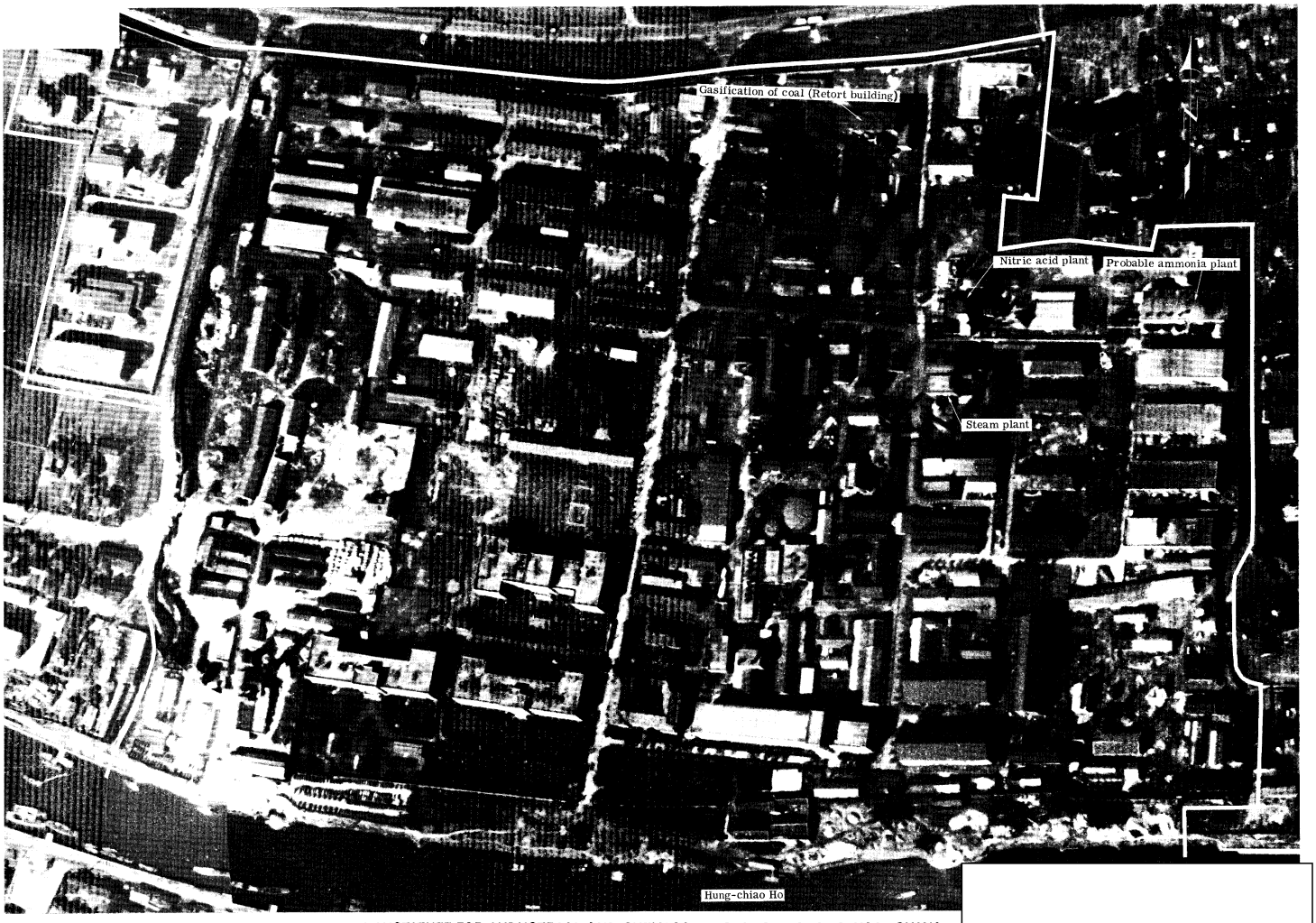
The Ta-lien Chemical Combine (38-58N 112-37E) is located on the western shore of Ta-lien Wan (Bay) approximately 3.9 nautical miles due east of the Chou-shui-tzu Airfield. The combine is a major producer of ammonia, sulfuric and nitric acids and several chemical fertilizers. Synthesis gas (containing hydrogen) for ammonia production is produced in one retort building (Item 4, Figure 10). The gas is then purified (Items 6, 7, 8 and 9, Figure 10) and compressed (Items 14 and 20, Figure 10). Ammonia is synthesized in converters in the converter sections (Items 15 and 21, Figure 10). No unusual facilities or equipment were observed within this plant, thus negating heavy water production.

REFERENCES

25X1 [redacted]

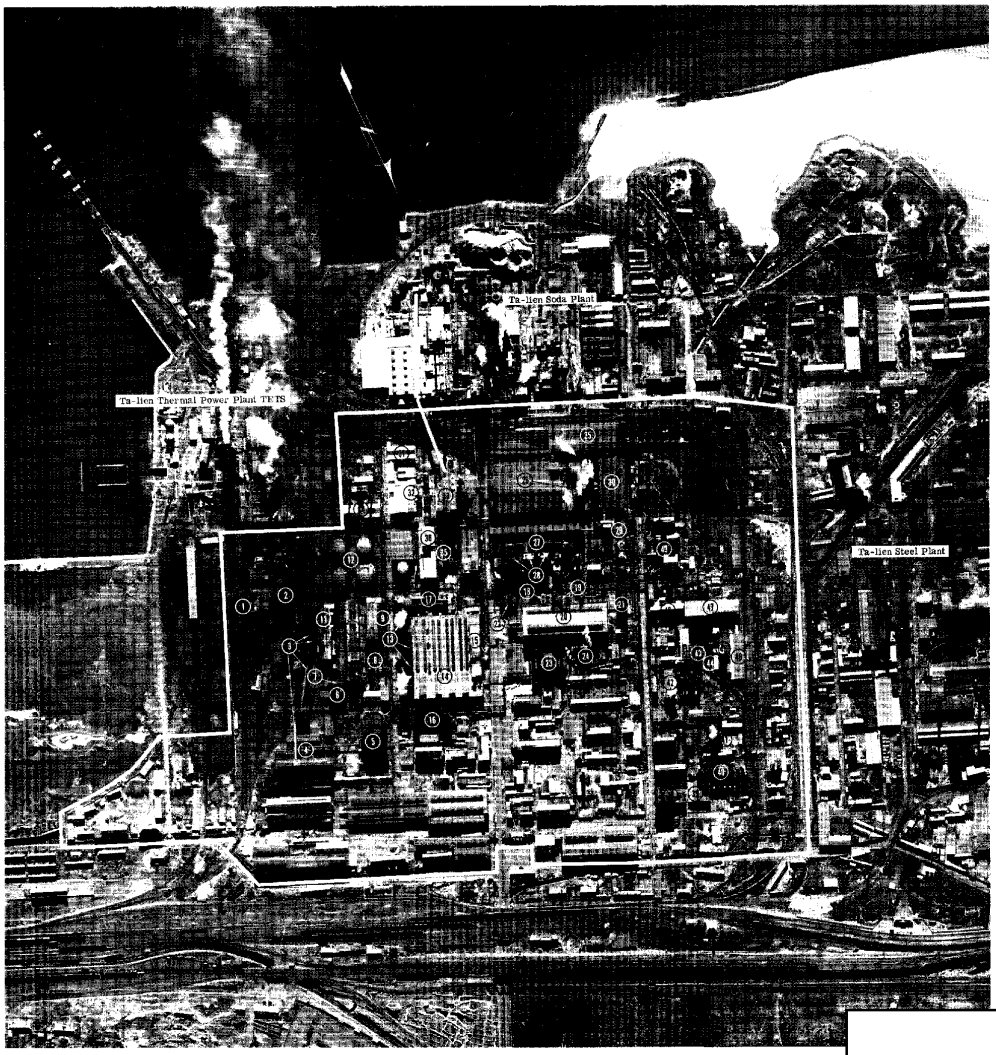
MAPS

ACIC. U. S. Air Target Chart, Series 200, Sheet 0381-10HL, 2nd ed., August 1963, scale 1:200,000. (SECRET)



25X1

FIGURE 9. TEIN-LI INSTITUTE FOR INDUSTRIAL AND CHEMICAL RESEARCH, SHANG-HAI, CHINA -



TA-LIEN (DAIREN) CHEMICAL COMBINE

Ammonia Production
1. Coal receiving yard
2. Possible crushing section
3. Conveyor system
4. Retort building
5. Gasholders
6. Scrubbers
7. CO_2 absorbers
8. Probable sulfur removal
9. Contact ovens
10. Sulfur removal
11. Possible reform ovens
12. Gasholders
13. Possible heat exchangers and oil filters
14. Compressor building
15. Converter section
16. Cooling tower
17. U/I building

Probable Ammonia Production
18. Possible heat exchangers
19. Possible oil filters
20. Compressor building
21. Converter tower
22. Gasholder
23. Cooling tower
24. Probable liquid ammonia production

Sulfuric Acid Production (Chamber Process)
25. Sulfide ore receiving house
26. Ore roasting section
27. Acid chambers
28. Tower section

Probable Ammonium Sulfide Production
29. Reactor building
30. Storage facility

Caustic Soda Production (Lime-Soda Process)
31. Calcium carbonate storage
32. Vertical kiln
33. Bicarbonate storage and treatment building
34. Boiler houses
35. Probable classifiers
36. Evaporation building
37. Caustic soda storage tanks

Nitric Acid Production
38. Compressor and filter building
39. Oxidation building
40. Medium pressure acid absorbers
41. Cooling tower
42. U/I building
43. Low pressure acid absorbers
44. Cooling tubes
45. Cooling tower

Possible Ammonium Nitrate Production
46. Reactor building
47. Possible granulating and storage building
48. Packing and shipping facility

Concentrated Nitric Acid Production
49. Possible acid absorbers

FIGURE 10. TA-LIEN (DAIREN) CHEMICAL COMBINE, CHINA -

25X1

25X1